299-E33-75 (A6883)

Log Data Report
(REVISED)

Borehole Information:

Borehole:	299-E33-75 (A6883)		Site:	216-B-7B Crib	
Coordinates (WA State Plane)		GWL[1] (ft):	n/a[2]	GWL Date:	n/a
North (m)	East (m)	Drill Date	TOC[3] Elevation	Total Depth (ft)	Type
137412	573796	01/48	653.86	150.0	cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	2.33	8.625	8.0	0.3125	0	144.0

Borehole Notes:

The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing outside diameter and thickness; the casing inside diameter is calculated. The drilling date and casing depth are derived from *Hanford Wells* (Chamness and Merz 1993). Coordinates and TOC elevation are derived from HWIS[4].

Logging Equipment Information:

Logging System:	Gamma 2B		Type: SGLS (35%)
Calibration Date:	09/00	Calibration Reference:	GJO-2001-245-TAR
		Logging Procedure:	MAC-HGLP 1.6.5
Logging System:	Gamma 1C		Type: HRLS
Calibration Date:	02/02	Calibration Reference:	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	
Date	06/28/01	08/09/01	08/09/01	08/09/01	
Logging Engineer	Kos	Kos	Kos	Kos	
Start Depth (ft)	151.5	0.0	34.5	45.0	
Finish Depth (ft)	74.0	34.0	44.5	75.0	
Count Time (sec)	100	100	30	100	
Live/Real	L	L	R	L	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	n/a	n/a	n/a	n/a	
Pre-Verification	B0010CAB	B0031CAB	B0031CAB	B0031CAB	
Start File	B0010000	B0031000	B0031069	B0031090	
Finish File	B0010155	B0031068	B0031089	B0031150	
Post-Verification	B0010CAA	B0031CAA	B0031CAA	B0031CAA	

High Rate Logging System (HRLS) Log Run Information:

Log Run	1				
Date	03/19/02				
Logging Engineer	Kos				
Start Depth (ft)	32.0				
Finish Depth (ft)	48.5				
Count Time (sec)	300				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	0.5				
ft/min	n/a				
Pre-Verification	D0028CAB				
Start File	D0029000				
Finish File	D0029033				
Post-Verification	D0029CAA				

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during June and August 2001 (SGLS) and March 2002 (HRLS). The HRLS was utilized to perform logging in high gamma flux zones, generally where the SGLS dead time exceeded 40 percent. No repeat sections were collected in this borehole.

The reference depth for logging measurements is typically the top of casing. The reference depth for the SGLS logging runs was ground level, and the reference depth for the HRLS logging run was the top of casing. To normalize the reference depth at the TOC, 2.33 ft should be added to the recorded SGLS depths. For example, the start depth for SGLS log run 2 is actually 2.33 ft rather than 0 ft.

Analysis Notes:

Analyst:	Henwood	**Date:**	03/27/02	**Reference:**	MAC-VZCP 1.7.9, Rev. 2

This Log Data Report is a revision of the report originally issued 10/04/01. This revision includes high rate data analysis results that were not previously reported and replaces the original Log Data Report.

Pre-run and post-run verification of the logging tool were performed for each day's log event. The post-run and pre-run verifications of the SGLS passed the acceptance criteria verification, indicating the detector was functioning normally. The HRLS pre-run verification also passed acceptance criteria. The HRLS post-run verification data file was lost. The post-verification spectra were used for the energy and resolution calibration for the data processing in all SGLS log runs.

A casing correction for 0.3125-in.-thick casing was applied to the log data.

Each spectrum collected during a log run was processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL, using an efficiency function and corrections for casing and dead time determined in calibrations. EXCEL templates named G2bSep01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (>40 %), gross count rates and radionuclide concentrations become increasingly less reliable, and may be significantly higher than the reported values. The HRLS is used in zones of high SGLS dead times to quantify the ^{137}Cs concentrations. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs), naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th [KUT]), a combination of man-made, KUT, total gamma and dead time, and a plot of total gamma and dead time. Data collected with the HRLS are substituted for SGLS data where appropriate to provide a continuous record of the most accurate ^{137}Cs concentrations.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction.

Results and Interpretations:

The man-made radionuclide detected in this borehole was ^{137}Cs. A zone of ^{137}Cs contamination was detected near the ground surface (log depth 4 through 18.0 ft) with activities ranging from 0.3 to about 60 pCi/g. ^{137}Cs also was detected between 34 and 57 ft. The highest concentrations were measured between 35 and 48 ft where high SGLS dead time occurred. HRLS data are substituted in this interval. The maximum concentration measured by the HRLS was about 7,600 pCi/g at 40.5 ft in depth.

Above the zone of intense gamma-ray activity, apparent ^{40}K activities are about 12 pCi/g. Below the zone of intense gamma-ray activity, apparent ^{40}K activities are about 18 pCi/g. The relatively high concentrations of ^{137}Cs below about 35 ft may correspond with the increase in ^{40}K activities and the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. At about 144 ft in depth, increased concentrations of naturally occurring KUT and the total gamma may be reflecting open hole conditions below the casing. Chamness and Merz (1993) report a drill depth of 150 ft and a completion depth of 144 ft.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

[1] GWL – groundwater level
[2] n/a – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System

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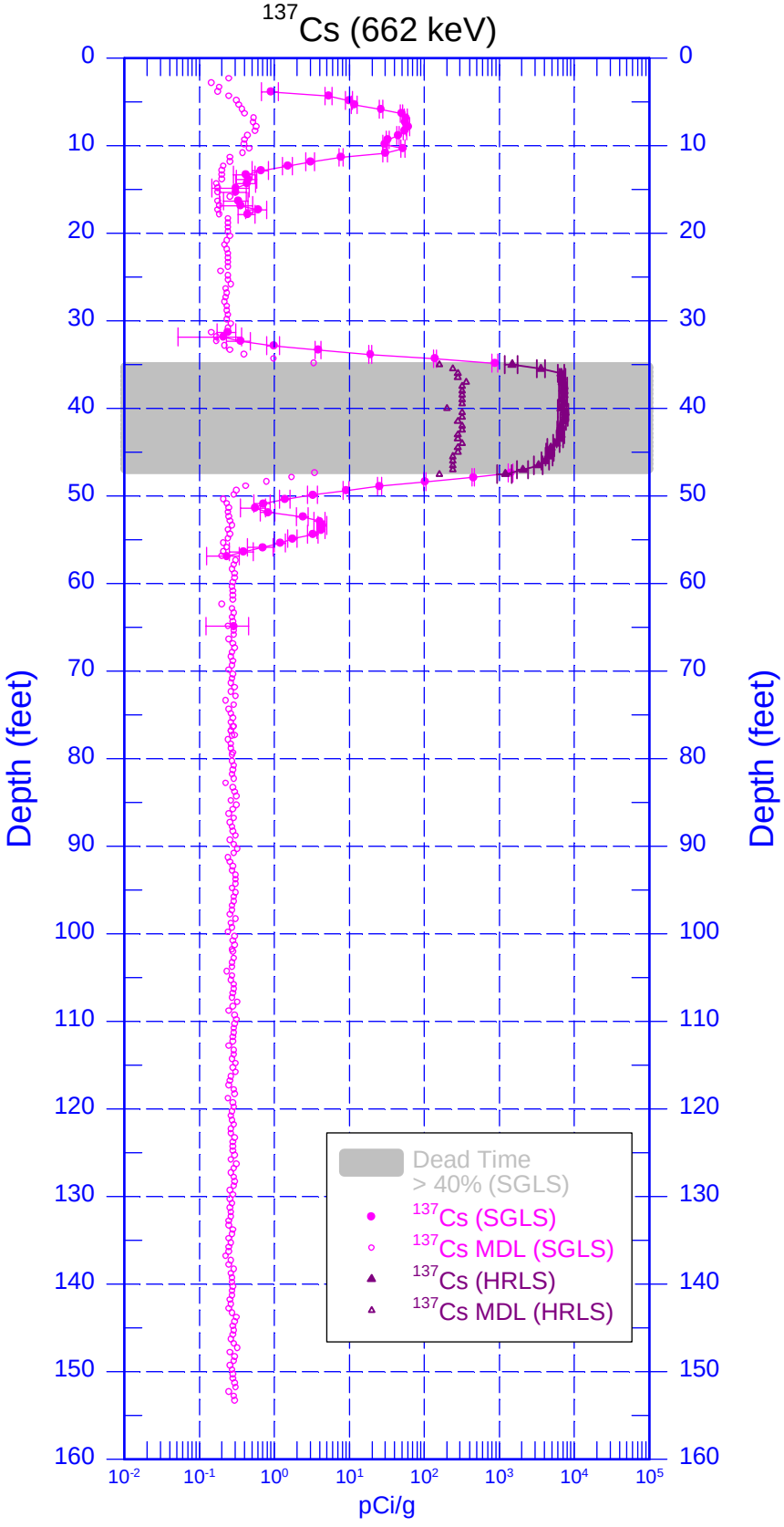
Man-Made Radionuclide



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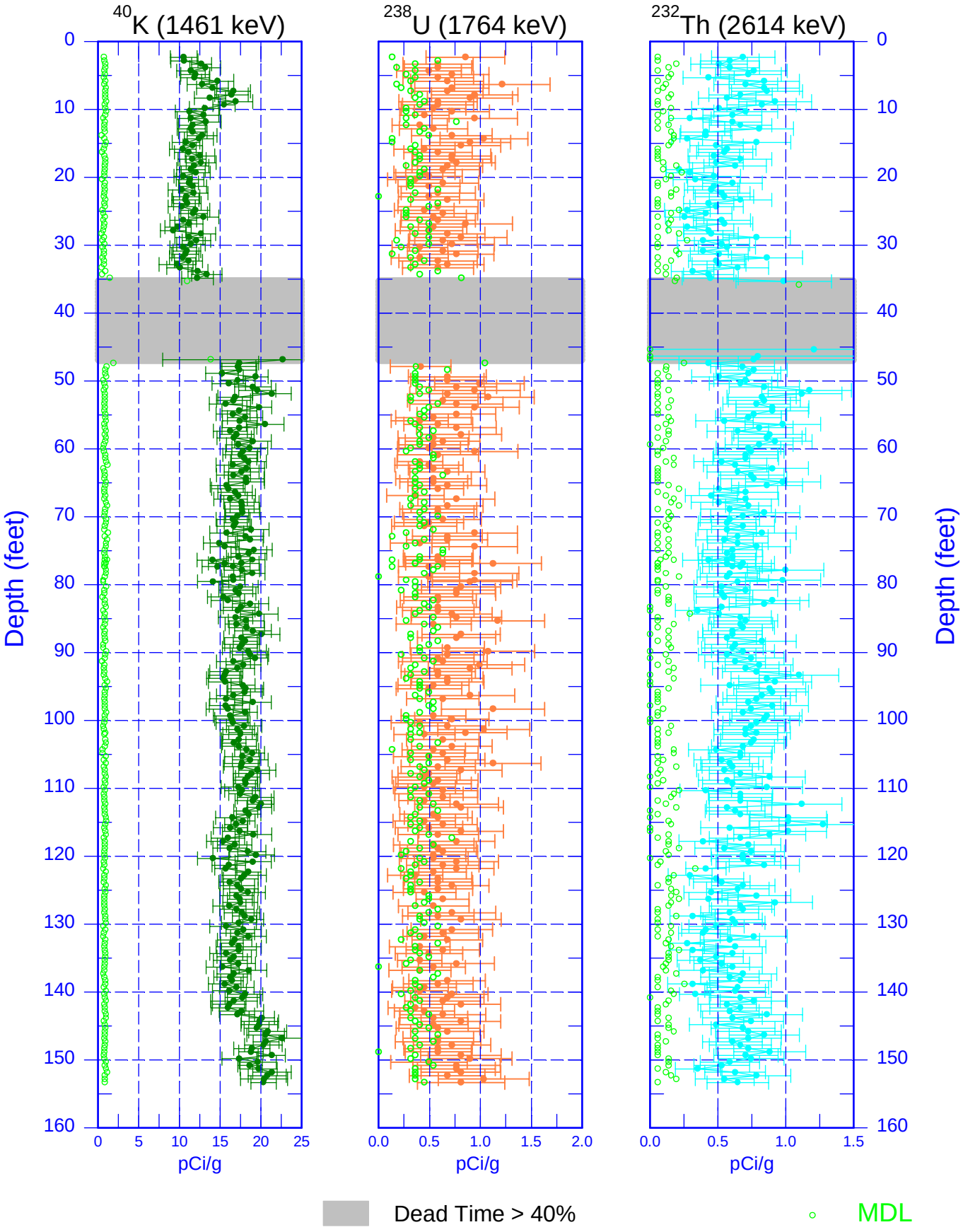
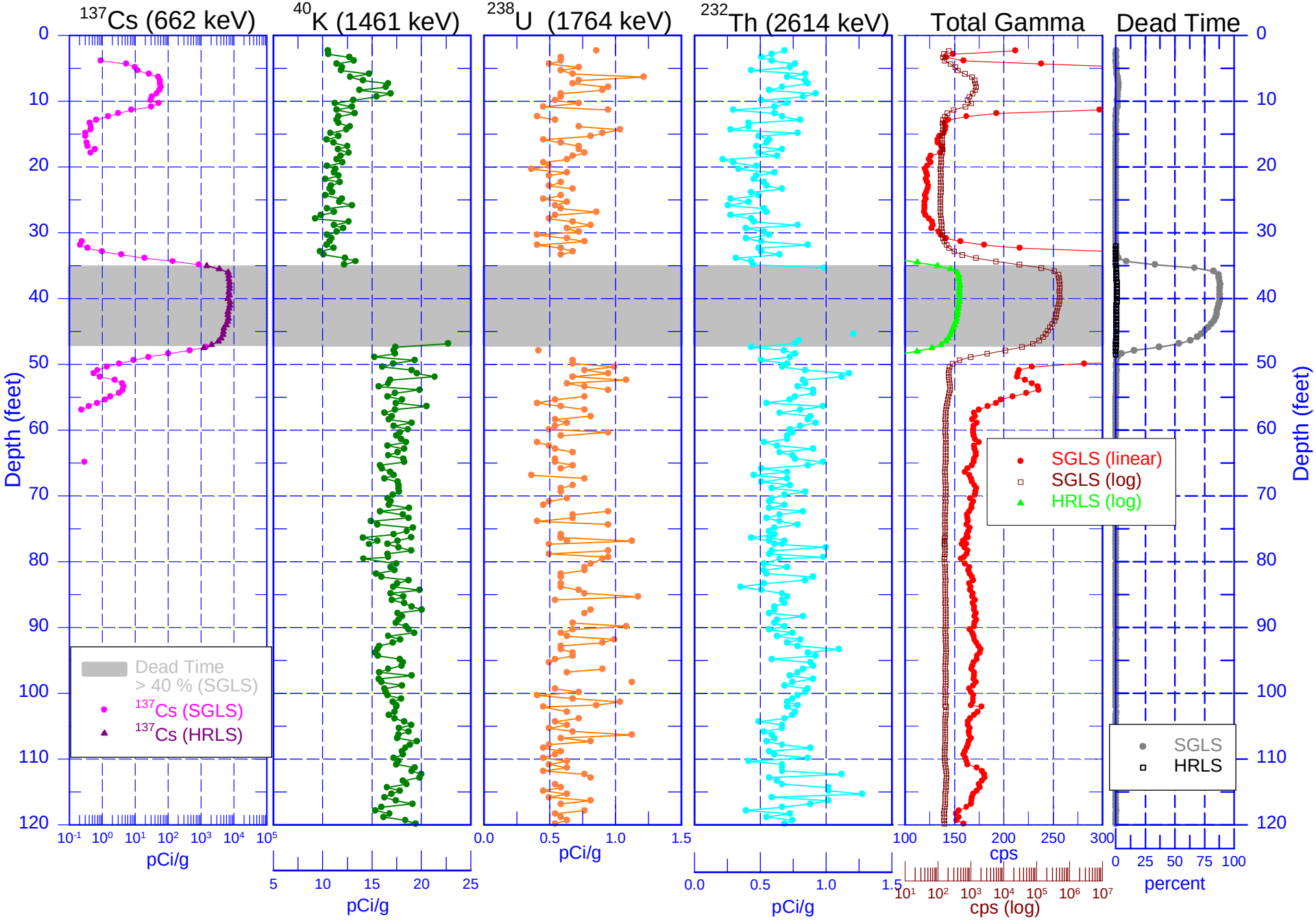
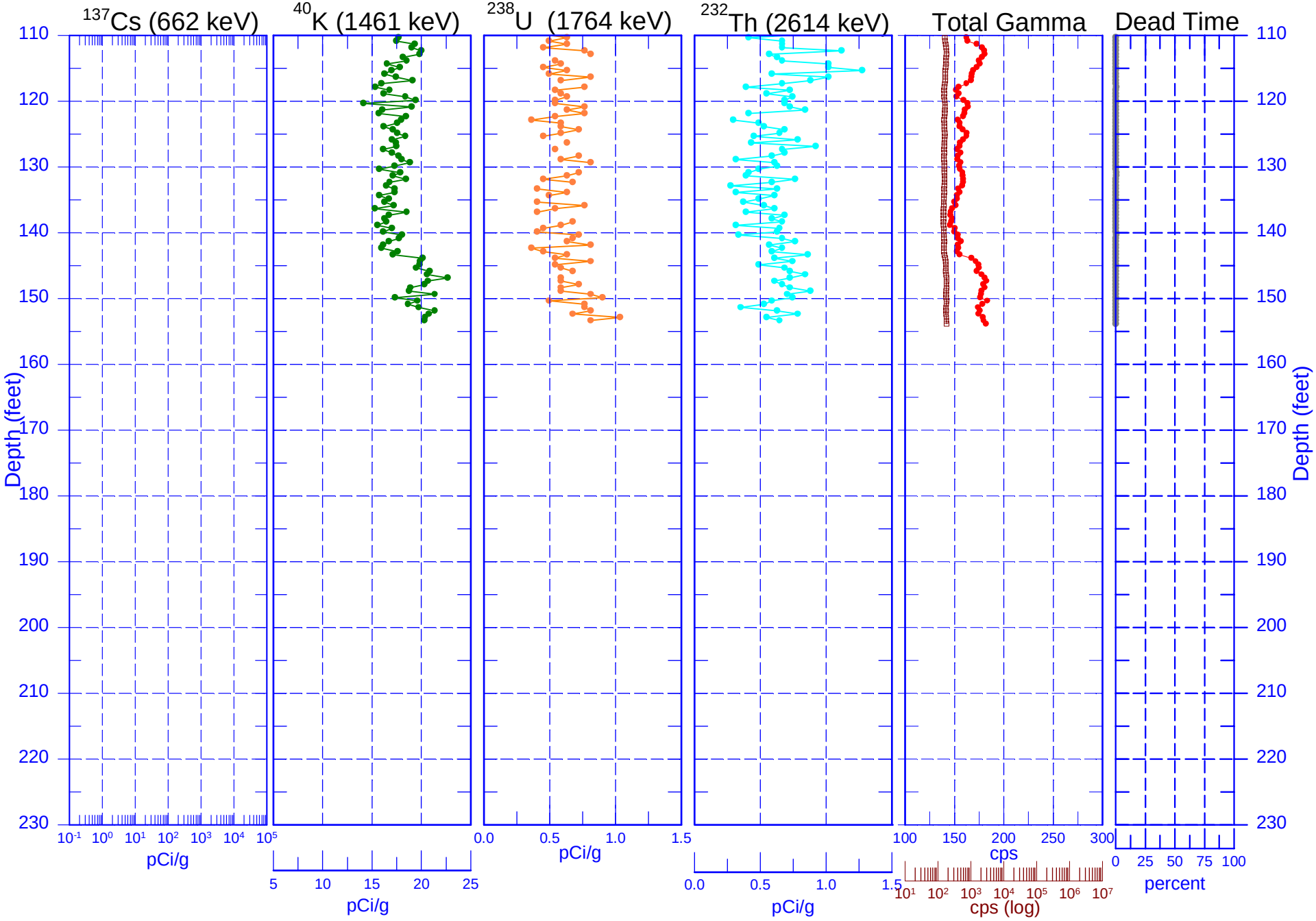
Natural Gamma Logs



299-E33-75 (A6883) Combination Plot



299-E33-75 (A6883) Combination Plot



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Total Gamma & Dead Time